

WEBT-coordinated optical monitoring of intra-night variable blazars – S5 0716+71 and OJ 287

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Abstract. Preliminary results of an optical R-band monitoring of two highly variable blazar-type objects, S5 0716+71 and OJ 287, as a part of a large coordinated program (WEBT) are presented. Both objects showed short-term variations: S5 0716+71 – increasing by 0.1 mag for 1.5 hours, and OJ 287 – fading by 0.03 mag for 4.5 hours. Our major goal is to emphasize the importance of coordinated efforts to study the physics of these interesting objects, even with small and mid-class facilities.

Key words: blazar; variability

WEBT-координиран оптически мониторинг на бързо-променливи блазари – S5 0716+71 и OJ 287

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Представени са резултати от оптически мониторинг на два силно променливи блазара, S5 0716+71 и OJ 287, като част от голяма координирана програма (WEBT). Наблюдавани са бързи вариации в блясъка на двата обекта: S5 0716+71 – увеличаване с 0.1 зв.вел. за 1.5 часа и OJ 287 – намаляване с 0.03 зв.вел. за 4.5 часа. Нашата основна цел е да подчертаем важноста на координираните усилия за изучаване на физиката на тези интересни обекти, даже и с малки и средно големи телескопи.

1 Introduction

WEBT (Mattox, 1998) stands for The Whole Earth Blazar Telescope, and is a large international collaboration to monitor blazar variability. Blazars, as one of the most spectacular members of the active galactic nuclei family, are notorious for their violent optical variability. The variations are commonly attributed to processes in a relativistic jet, pointed directly to the observer. Therefore, their study may provide a unique insight into the physics of the jet phenomenon. This is especially true when a dense sampling in the optical is supplemented with observation in other wavelengths (e.g. X and γ -rays, IR, radio).

All this is our motivation to join the efforts of the WEBT community in monitoring some of the objects of common interest. In this letter we present some preliminary results of a search for intra-night variability in two blazars – S5 0716+71 and OJ 287.

2 Observations and Results

Although not currently in an active WEBT campaign (the last time the object was monitored in 2003-2004 by INTEGRAL satellite, and from the ground in the optical, Ostorero et al., 2006) the blazar S5 0716+71 was monitored on 16.01.2007 (UT 21:10 – 22:30) with the 0.6-m telescope of Belogradchik observatory, Bulgaria (Bachev et al., 1999) as it was reported to be unusually bright. The average R_c magnitude of the object was about 12.83 (± 0.03), close to its historical maximum. The blazar is known to be intra-night variable. Fig. 1a shows a clear trend of brightness increase, from $R=12.88$ to 12.78 , emerging much above the photometric errors (typically less than 0.01 mag). The object was measured in respect to star "2" ($R=11.12$, Villata et al., 1998), as were few other check stars none of which showed any trend of variability for the time of monitoring. One should point out that despite the relatively poor atmospheric conditions that night (the signal from the main standard varied at about 30-50% from its usual level), the differential photometry between the check stars does not show

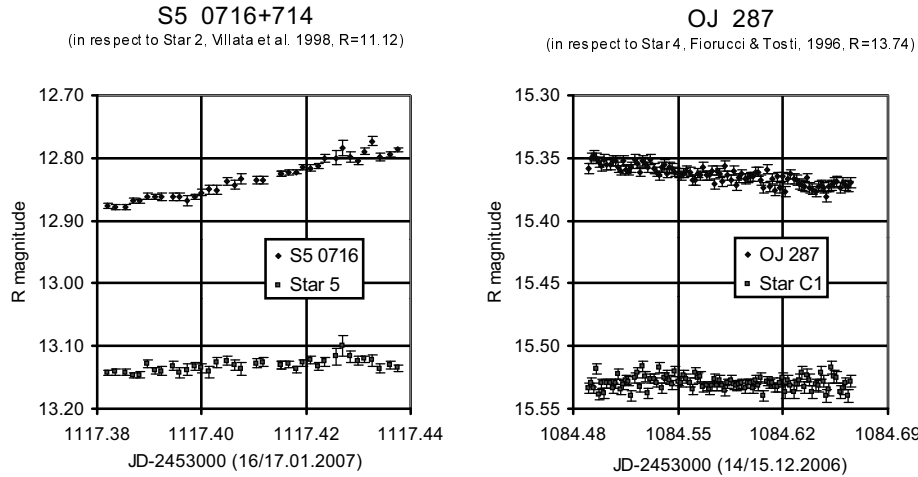


Fig. 1. Short-term variability of S5 0716+71 (left) and OJ 287 (right), see the text

any variations above the 0.01 mag level. This implies a rather high reliability of our differential photometry.

OJ 287 is the second blazar we observed recently, this time as a part of an active WEBT campaign. Except the intensive optical monitoring, including polarimetric studies, OJ 287 was monitored with XMM-Newton satellite in X-rays, as well as in radio with VLBA/VLBI. We monitored the object on 14/15.12.2006 (UT 23:30 – 04:00) with the 2-m RCC telescope of NAO-Rozhen, equipped with a VersArray CCD and the new auto-guiding system (Bonev et al. 2006). The reductions and photometry were done with MIDAS/DAOPHOT. The object faded for the time of monitoring (~ 4.5 hours) by ~ 0.03 mag from 15.35 to 15.38 mag in R_c , a trend clearly detectable due to the much smaller photometric errors (0.004 mag). Fig. 1b shows the light curve for the blazar and a check star.

3 Conclusion

Two intra-night variable blazars were monitored as a part of coordinated WEBT campaigns. Both objects showed variations for the time of monitoring. Despite the relatively poor weather in some of the nights, the differential CCD photometry proved to be reliable enough to reveal the real variations of the objects, even at a relatively small scale.

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